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GSO 213 (1994) (English): INDUSTRIAL SAFETY AND
HEALTH REGULATIONS – EQUIPMENT – PORTABLE TOOLS



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هيئة التقييس لدول مجلس التعاون دول الخليج العربية
STANDARDIZATION ORGANIZATION FOR G.C.C (GSO)



GSO 213/1994

اشتراطات السلامة والصحة الصناعية -

الأجهزة - الأدوات والعدد النقالي

**INDUSTRIAL SAFETY AND HEALTH
REGULATIONS — EQUIPMENT
— PORTABLE TOOLS**

ICS:13.100

INDUSTRIAL SAFETY AND HEALTH REGULATIONS — EQUIPMENT – PORTABLE TOOLS

Date of GSMO Board of Directors Approval : 13-06-1415H (16-11-1994)
Issuing status : Technical Regulation

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INDUSTRIAL SAFETY AND HEALTH REGULATIONS — EQUIPMENT – PORTABLE TOOLS

1. SCOPE AND FIELD OF APPLICATION

This standard is concerned with Industrial Safety and Health Regulations - Equipment: Portable Tools.

2. COMPLEMENTARY REFERENCES

- 2.1 GSO 68/1987 “Industrial Safety and Health Regulations-Equipment-Machinery and Guarding - Part 1: General Requirements”.
- 2.2 GSO 69/1987 “Industrial Safety and Health Regulations-Equipment-Machinery and Guarding - Part 2: Wood Working Machinery”.
- 2.3 GSO 71/1987 “Industrial Safety and Health Regulations-Equipment-Machinery and Guarding - Part 3: Abrasive Wheel Machinery”.

3. DEFINITIONS

3.1 Abrasive Wheel Terms

- 3.1.1 Flaring Cup Wheel: Wheels having double diameter dimensions D and J. Grinding is always performed on rim face, W dimension. These wheels are subject to all limitations of use and mounting listed for straight sided cup wheels. See Figure (2). Side grinding wheel having a wall flared or tapered outward from the back. Wall thickness at the back is normally greater than at the grinding face (W).
- 3.1.2 Limitation: Minimum back thickness, E dimension shall not be less than one-fourth T dimension. In addition when unthreaded hole wheels are specified the inside flat, K dimension, shall be large enough to accommodate a suitable flange.
- 3.1.3 Mounted Wheels: Usually 5 cm diameter or smaller, and of various shapes, may be either organic or inorganic bonded abrasive wheels.
- 3.1.4 Nip Point: Point or line formed where parts rotate toward each other or where one part rotates toward a stationary object.
- 3.1.5 Organic Bonded Wheels: Wheels which are bonded by means of an organic material such as resin, rubber, shellac, or other similar bonding agent.
- 3.1.6 Portable Grinder: Grinding machine designed to be hand held and may be easily moved from one location to another.
- 3.1.7 Reinforced Wheels: A class of organic wheels which contain strengthening fabric or filament. The term “Reinforced” does not cover wheels using such mechanical additions as steel rings, steel cup backs or wire or tap winding.

- 3.1.8 Safety Guard: Enclosure designed to restrain the pieces of the grinding wheel and furnish an possible protection in the event that the wheel is broken in operation.
- 3.1.9 Straight Cup Wheels: Grinding is always performed on rim face, W dimension. See Figure (3). Side grinding wheel having a diameter. thickness and hole with one side straight or flat and the opposite side recessed.
- 3.1.10 Limitation: Minimum back thickness. E dimension, shall not be less than one-fourth T dimension. In addition. when unthreaded hole wheels are specified, the inside flat, K dimensions, must be large enough to accommodate a suitable flange.
- 3.1.11 Straight Wheels: Used only for grinding on the periphery of the wheel and mounted between flanges. See Figure (I).
- 3.1.12 Limitation: Hole dimension (H) should not be greater than two-thirds of wheel diameter dimension (D) for precision, cylindrical. centerless, or surface grinding applications. Maximum hole size for all other applications shall not exceed one-half of wheel diameter.
- 3.1.13 Tuck Pointing: Removal, by grinding, of cement, mortar, or other nonmetallic jointing materials.
- 3.1.14 Tuck Pointing Wheels: Usually straight reinforced organic bonded wheels having diameter, thickness and hole size dimension. They are subject to the same limitations of use and mounted as the straight wheel defined above.
- 3.2 Explosive-Actuated Fastening Tools Terms
 - 3.2.1 Explosive Powerload, Also Known as Load: Any substance in any form capable of producing a propellant force.
 - 3.2.2 Hammer-operated Piston Tool; Low-velocity Type: A total which, by means of a heavy mass hammer supplemented by a load, moves a piston designed to be captive to drive a stud, pin, or fastener into a work surface, always starting the fastener at rest and in contact with the work surface. It will not have a mean velocity in excess of 40 m/sec..
 - 3.2.3 High-Velocity Tool: A tool or machine which, when used with a load, propels or discharges a stud, pin, or fastener, at velocities in excess of 40 m/s for the purpose of impinging it upon, affixing it to, or penetrating another object or material.
 - 3.2.4 Low-Velocity Piston Tool: A tool that utilizes a piston designed to be captive to drive a stud, pin, or fastener into a work surface. It will not have a mean velocity in excess of 40 m/sec.
 - 3.2.5 Protective Shield or Guard: Device on guard attached to the muzzle end of the tool, which is designed to confine flying particles.
 - 3.2.6 stud, Pin, or Fastener: Fastening device specifically designed and manufactured for use in explosive-actuated fastening tools.

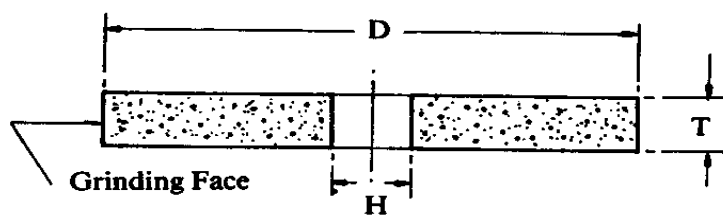


Figure (1)
Straight Wheel

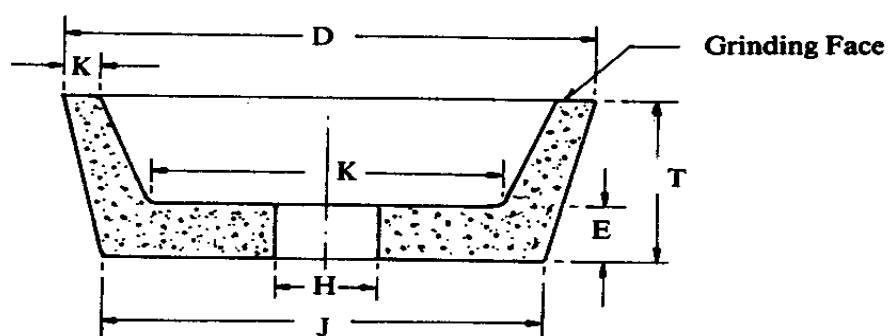


Figure (2)
Flaring-cup Wheel

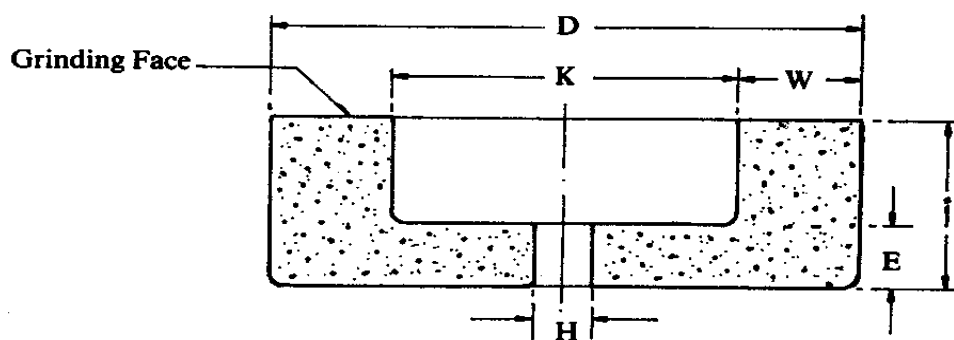


Figure (3)
Straight-cup Wheel

- 3.2.7 To Chamber: Fit properly without the use of excess force, the case being duly supported.
- 3.2.8 Tool: An explosive-actuated fastening tool (unless otherwise indicated) and all the accessories pertaining thereto.
- 3.3 Jack Terms
- 3.3.1 Jack: An appliance for lifting and lowering or moving horizontally a load by application of a pushing force.
- 3.3.2 Rating: The maximum working load for which a jack is designed to lift safely throughout its specified amount of travel.
- Note: To raise the rated load of a jack, the point of application of the load, the applied force, and the length of lever arm should be those designated by the manufacturer for the particular jack considered.

4. RMULATIONS

- 4.1 Portable tools
- 4.1.1 Equipment
- 4.1.1.1 General Requirements
- 4.1.1.1.1 Each employer shall be responsible for the safe condition of tools and equipment.
- 4.1.1.1.2 When power-operated tools are designed to accommodate guards. they shall be equipped with such guards when in use.
- 4.1.1.1.3 Employees using hand and power tools and exposed to the hazard of falling, flying, abrasive, and splashing objects, or exposed to harmful dusts, fumes, mists, vapors, or gases shall be provided with the particular persons protective equipment necessary to protect them from these hazards.
- 4.1.1.1.4 All hand-held powered platen sanders, grinders with wheels 50 mm diameter or less, routers, planers, laminate trimmers, nibblers, shears, scroll saws, and jigsaws with blade shanks 6 mm wide or less shall be equipped with only a positive "On-off" control.
- 4.1.1.1.5 All cracked or defective tools shall be removed from service immediately
- 4.1.1.2 Hand Tools
- 4.1.1.2.1 Wrenches, including adjustable, pipe and socket wrenches shall not be used when jaws are sprung to the point that slippage occurs.
- 4.1.1.2.2 Impact tools, such as drift pins, wedges, and chisels, shall be kept free from mushroomed heads.
- 4.1.1.2.3 The wooden handles of tools shall be kept free from splinters or cracks and shall be kept tightly fixed in the tool.
- 4.1.1.3 Power-Operated Hand Tools
- 4.1.1.3.1 Electric power operated tools shall be of the approved doubles-insulated type or be grounded. The use of electric cords for hoisting or lowering tools shall not be permitted.

- 4.1.1.3.2 Pneumatic power tools shall be secured to the hose or whip by some positive means to prevent the tool from becoming accidentally disconnected, such as safety chains or wire through hose connector.
- 4.1.1.3.3 Safety clips or retainers shall be securely installed and maintained on pneumatic impact (percussion) tools to prevent attachments from being accidentally expelled.
- 4.1.1.3.4 All pneumatically driven nailers, staplers, and other similar equipment Provided With automatic fastener feed, which operate at more than 7 kg/sq cm pressure, shall have a safety device on the muzzle to prevent the tool from ejecting fasteners, unless the muzzle is in contact with the work surface.
- 4.1.1.3.5 Compressed air shall not be used for cleaning purposes except when reduced to less than 2 kg/sq cm and then only with the use of effective chip guarding and personal protective equipment. The 2 kg/sq cm requirement does not apply to concrete forms, mill scale and similar cleaning purposes.
- 4.1.1.3.6 The manufacturer's safe operating pressure for hoses, pipes, valves, filters, and other fittings shall not be exceeded.
- 4.1.1.3.7 The use of hose for hoisting or lowering tools shall not be permitted.
- 4.1.1.3.8 All hoses exceeding 13 mm inside diameter shall have a safety device at the source of supply or branch line to reduce pressure in case of hose failure.
- 4.1.1.3.9 Airless spray guns of the type which atomize paints and fluids at high pressures of 70 kg/sq cm or more shall be equipped with automatic or visible manual safety devices which will prevent pulling of the trigger to prevent release of the paint or fluid until the safety device is manually released.
- 4.1.1.3.10 In lieu of the above, a diffuser nut which will prevent high pressure. high velocity release, while the nozzle-tip is removed, plus a nozzle tip guard which will prevent the tip from coming into contact with the operator, or other equivalent protection means shall be provided.
- 4.1.1.3.11 All fuel powered tools shall be stopped while being refueled, serviced, or maintained.
- 4.1.1.3.12 The fluid in hydraulic powered tools shall be free-resistant, and shall retain its operating characteristics at the most extreme temperatures to which it will be exposed.
- 4.1.1.3.13 The manufacturer's safe operating pressures for hoses, valves, pipes, filters, and other fittings shall not be exceeded.
- 4.1.2 Portable Powered Tools
 - 4.1.2.1 Portable Circular Saws: All portable, power-driven circular saws having a blade diameter greater than 5 cm shall be equipped with guards above and below the base plate or shoe.

The upper guard shall cover the saw to the depth of the teeth, except for the minimum arc required to permit the base to be tilted for bevel cuts. The lower guard shall cover the saw to the depth of the teeth, except for the minimum arc required to allow proper retraction and contact with the work. When the tool is withdrawn from the work, the lower guard shall automatically and instantly return

to covering position. This subparagraph does not apply to circular saws used in the meat industry for meat cutting purposes.

4.1.2.2 Switches and Controls

4.1.2.2.1 All hand-held powered circular saws having a blade diameter greater than 5 cm, electric, hydraulic or pneumatic chain saws, and percussion tools without positive accessory holding means shall be equipped with a constant pressure switch or control that will shut off the power when the pressure is released. All hand-held powered chain saws shall be equipped with a constant pressure throttle control that will shut off the power to the saw chain when the pressure is released.

4.1.2.2.2 All hand-held powered drills, tappers, fastener drivers, horizontal, vertical, and angle grinders with wheels greater than 5 cm in diameter, disc sanders with discs greater than 5 cm in diameter, belt sanders, reciprocating (saber) saws, scroll mid jig saws with blade shanks greater than 6 mm and other similar power operated tools ~ be equipped with a constant pressure switch or control, and may have a lock-on control provided that turnoff can be accomplished by a single motion of the same finger or fingers that turn it on.

4.1.2.2.3 Saber, scroll, and jig saws with non-standard blade holders may use blade with shanks which are nonuniform in width, provided that the narrowest portion of the blade shank is an integral part in mounting the blade. Blade shank width shall be measured at the narrowest portion of the blade shank when saber, scroll, and jig saws have non-standard blade holders.

4.1.2.2.4 The operating control on hand-held powered tools shall be so located as to minimize the possibility of its accidental operation, if such accidental operation would constitute a hazard to employees. This subparagraph does not apply to concrete vibrators, concrete breakers, powered tampers, jack hammers, and rock drills, appliances, or to fixed machinery.

4.1.2.3 Portable Belt Sanding Machines: Belt sanding machines shall be provided with guards at each nip point where the sanding belt runs on to a pulley. These guards shall effectively prevent the hands or fingers of the operator from coming in contact with the nip points. The unused run of the sanding belt shall be guarded against accidental contact.

4.1.3 Pneumatic Powered Tools and Hoses

4.1.3.1 A tool retainer shall be installed on each piece of equipment which, without such a retainer, may eject the tool.

4.1.3.2 Hose and hose connections used for conducting compressed air to utilization equipment shall be so as to withstand the pressure and service to which they are subjected.

4.1.4 Portable Abrasive Wheels

4.1.4.1 General Requirements:

The requirements of this paragraph shall not apply to the following classes of wheels and conditions:

Wheels used for internal work, while within the work being ground; and wheels made from natural sandstone and metal. Wooden, cloth or paper discs having a

layer of abrasive on the surface. Mounted wheels used in portable operations 5 cm and smaller in diameter and cones, plugs, and threaded hole pot balls where the work offers required protection.

- 4.1.4.1.1 Abrasive wheels shall be used only on machines provided with safety guards as defined by the following:
 - 4.1.4.1.1.1 All grinding machines shall be supplied with sufficient power to maintain the spindle speed at safe levels under all conditions of normal operation.
 - 4.1.4.1.1.2 Floor and bench-mounted grinders shall be provided with work rests which are rigidly supported and readily adjustable. Such work rests shall be kept at a distance not to exceed 3 mm from the surface of the wheel.
 - 4.1.4.1.1.3 All employees using abrasive wheels shall be protected by eye protection equipment, except when adequate eye protection is afforded by eye shields which are permanently attached to the bench or floor stand.
 - 4.1.4.1.1.4 A safety guard shall cover the spindle end, nut and flange projections.

Exception: Safety guards on all operations where the work provides a suitable measure of protection to the operator may be so constructed that the spindle end, nut and outer flange are exposed. The spindle end, nut, and outer flange may be exposed on portable machines designed for, and used with abrasive wheels, cutting off wheels, and tuck pointing wheels. Where the nature of the work is such as to entirely cover the side of the wheel, the side covers of the guard may be omitted.

- 4.1.4.2 Cup wheels: Cup wheels shall be protected by safety guards as specified in 4.1.4.1; or, special "Revolving cup guards" which are mounted behind the wheel and turn with it. They shall be made of steel or other material with adequate strength and shall enclose the wheel sides upward from the back for one-third of the wheel of the wheel thickness. The mounting features shall conform to 4.1.4.5. The clearance between the wheel side and the guard shall not exceed 2 mm.
- 4.1.4.3 Vertical portable grinders: Safety guards used on machines known as right angle head or vertical portable grinders shall have a maximum exposure of 180o, and the guard shall be so located as to be between the operator and the wheel during use. Adjustment of the guard shall be such that pieces of an accidentally broken wheel will be deflected away from the operator (See Figure 4).
- 4.1.4.4 Other portable grinders: The maximum angular exposure of the grinding wheel periphery and sides for safety guards used on other portable grinding machines shall not exceed 180o and the top half of the wheel shall be enclosed at all times (See Figures 5 and 6)
- 4.1.4.5 Mounting and Inspection of Abrasive Wheels
 - 4.1.4.5.1 immediately before mounting, all wheels shall be closely inspected and sounded by the user to make sure they have not been damaged in transit, storage, or otherwise. Apply ring test by tapping wheel gently with a light nonmetallic implement such as the handle of a screwdriver for light wheels, or a wooden mallet for heavier wheels. If they sound cracked (dead) they shall not be used. The spindle speed of the machine shall be checked before mounting the wheel to

be certain that it does not exceed the maximum operating speed marked on the wheel.

4.1.4.5.2 Grinding wheels shall fit freely on the spindle and remain free under all grinding conditions. A controlled clearance between the wheel hole and the machine spindle (or wheel sleeves or adaptors) is essential to avoid excessive pressure resulting from mounting and form spindle expansion. To accomplish this, the machine spindle shall be made to a nominal size of + 0.0 to 0.05 mm, and the wheel hole shall be made suitable oversize to ensure safety clearance under the conditions of operating heat and pressure.

4.1.4.5.3 All contact surfaces of wheels, blotters, and flanges shall be flat and free from foreign matter.

4.1.4.5.4 When a bushing is used in the wheel hole it shall not exceed the width of the wheel and shall not contact the flanges.

4.1.5 Explosive Actuated Fastening Tools

4.1.5.1 General Requirements:

Operators and assistants using tools shall be safeguarded by eye protection means. Head and face protection means shall be used as required by working conditions.

4.1.5.2 Tool Inspection, Maintenance and Handling

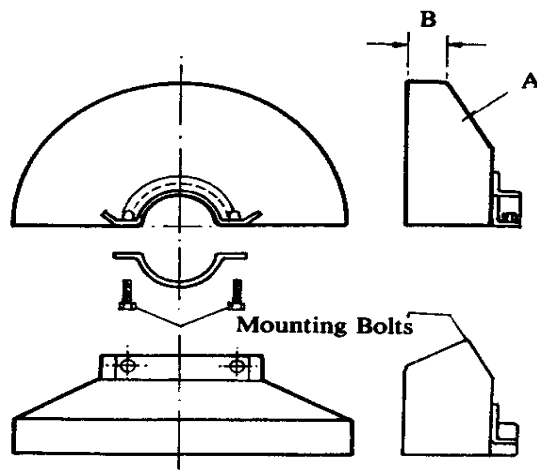
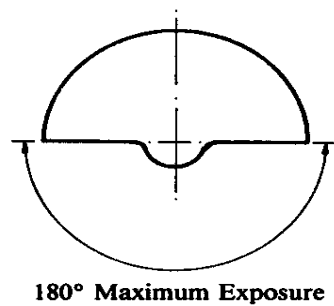
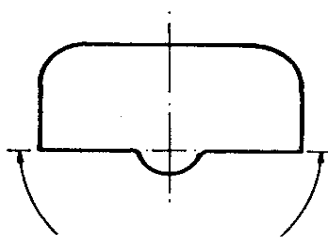
4.1.5.2.1 The muzzle end of the tool shall be so designed that suitable protective shields, guards, jigs, or fixtures, designed and built by the manufacturer of the tool being used, can be mounted perpendicular to the barrel. A standard spall shield shall be supplied with each tool.

4.1.5.2.2 The tool shall be so designed that it shall not, in normal use, propel or discharge a stud, pin, or fastener while loading, or during preparation to fire, or if the tool should be dropped while being loaded.

4.1.5.2.3 Firing of the tools shall be dependent upon at least two separate and distinct operations by the operator, with the final firing movement being separate from the process of bringing the tool into the firing position.

4.1.5.2.4 The tool shall be so designed that positive means of varying the power be available or can be made available to the operator as part of the tool, or as an auxiliary, in order to make it possible for the operator to select a power level adequate to perform the desired work without excessive force.

4.1.5.2.5 The tool shall be so designed that all breeching parts will be reasonably visible to allow check of any foreign matter that may be present.

**Figure 4****Figure 5****180° Maximum Exposure****Figure 6**

- 4.1.5.2.6 Tools of the low-velocity piston type shall conform to the above mentioned safety requirements and shall be so designed as not to be operable other than against a work surface, and unless the operator is holding the tool against the work surface with a force at least 2 kg greater than the total weight of the tool.
- 4.1.5.2.7 High velocity tools shall conform to all of the above mentioned safety requirements as well as the following:

- 4.1.5.2.7.1 The muzzle end of the tool shall have a protective shield or guard at least 9 cm in diameter, mounted perpendicular to and concentric with the barrel. and so designed as to confine any flying fragments or particles that might otherwise create a hazard at the time of ruing.
- 4.1.5.2.7.2 Where a standard shield or guard cannot be used, or where it does not cover all apparent avenues through which flying particles might escape, a special shield, guard, fixture, or jig designed and built by the manufacturer of the tool shall be used as a substitute, to provide this degree of protection.
- 4.1.5.2.7.3 The tool shall be so designed that it cannot be fired unless it is equipped with a standard protective shield or guard, or a special shield, guard, fixtures, or jig.
- 4.1.5.2.7.4 The tool shall be so designed that it will not operate when equipped with the standard guard indexed to the center position or if any bearing surface or the guard is tilted by more than 8 degrees from contact with the work surface.
- 4.1.5.3 Requirements for Loads and Fasteners
 - 4.1.5.3.1 There shall be a standard means of indentifying the power levels of loads used in tools.
 - 4.1.5.3.2 Caseless loads shall be coded to identify similar powerload levels by color, number, configuration, or other appropriate method.
 - 4.1.5.3.3 No load (cased or caseless) shall be used if it will accurately chamber in any existing approved commercially available low-velocity piston tool or hammer-operated piston tool; low-velocity type and will cause a fastener to have a mean velocity of excess of 90 m/sec when measured 2 m from the muzzle end of the barrel. No individual test firing of a series shall exceed 90 m/sec by more than 8 percent.
 - 4.1.5.3.4 Fasteners used in tools shall be only those specifically manufactured for use in such tools.
- 4.1.5.4 Operating Requirements
 - 4.1.5.4.1 Only employees who have been trained in the operation of the particular tool in use shall be allowed to operate a power-actuated tool.
 - 4.1.5.4.2 The tool shall be tested each day before loading to see that safety devices are in proper working condition. The method of testing shall be in accordance with the manufacturer's recommended procedure.
 - 4.1.5.4.3 personal protective equipment shall be used.
 - 4.1.5.4.4 Before ~ a tool, the operator shall inspect it to determine to his satisfaction that it is clew, that all moving parts operate freely, and that the barrel is free from any obstruction.
 - 4.1.5.4.5 When a tool develops a defect during use, the operator shall immediately cease to use it, until it is properly repaired.

- 4.1.5.4.6 Neither loaded nor empty tools are to be pointed at any workman, and hands should be kept clear of the open barrel end.
- 4.1.5.4.7 No tools shall be loaded unless they are prepared for immediate use, nor shall an unattended tool be left loaded.
- 4.1.5.4.8 In case of a misfire, the operator shall hold the tool in the operating position for at least 30 sec. He shall then try to operate the tool a second time. He shall wait another 30 sec, holding the tool in the operating position; then he shall proceed to remove the explosive load in accordance with the manufacturer's instructions. Misfired cartridges should be carefully placed in a metal container rolled with water, and returned to the supervisor for disposal.
- 4.1.5.4.9 Fasteners shall not be driven into hard or brittle materials including, but not limited to, cast iron, glazed tiles, surface-hardened steel, glass blocks, fire bricks, face bricks, or hollow tiles.
- 4.1.5.4.10 Driving into materials easily penetrated shall be avoided unless such materials are backed by a substance that will prevent the pin or fastener from passing completely through and creating a flying-missile hazard on the other side.
- 4.1.5.4.11 Fasteners shall not be driven directly into materials such as brick or concrete closer than 8 cm from the unsupported edge or corner, or into steel surfaces closer than 13 mm from the unsupported edge or corner, unless a special guard, Fixture, or jig is used. (Exception: Low-velocity tools may drive no closer than 5 cm from an edge in concrete or 6 mm in steel).
- 4.1.5.4.12 When fastening other materials, such as a 4 x 9 cm wood section to a concrete surface, it is permissible to drive a fastener of no greater than 6 mm shank diameter not closer than 5 cm from the unsupported edge or corner of the work surface.
- 4.1.5.4.13 Fasteners shall not be driven through existing holes unless a positive guide is used to secure accurate alignment.
- 4.1.5.4.14 No fastener shall be driven into a spalled area caused by an unsatisfactory fastening.
- 4.1.5.4.15 Tools shall not be used in an explosive or flammable atmosphere.
- 4.1.5.4.16 All tools shall be used with the correct shield, guard, or attachment recommended by the manufacturer.
- 4.1.6 Jacks
 - 4.1.6.1 Loading and Marking
 - 4.1.6.1.1 The operator shall make sure that the jack used has a rating sufficient to lift and sustain the load.
 - 4.1.6.1.2 The rated load shall be legibly and permanently marked in a prominent location on the jack by casting, stamping, or by any other suitable means.
 - 4.1.6.3 All jacks shall have a positive stop to prevent over-travel.
 - 4.1.6.2 Operation and maintenance

- 4.1.6.2.1 In the absence of a firm foundation, the base of the jack shall be blocked. If there is a possibility of slippage of the cap, a block shall be placed in between the cap and the load.
- 4.1.6.2.2 Hydraulic jacks used in lifting slab construction shall have a safety device which will stop the operation when the 10 mm levelling tolerance is exceeded.
- 4.1.6.2.3 If lift slabs are automatically controlled, a device shall be installed which will stop the operation when the 10 mm levelling tolerance is exceeded.
- 4.1.6.2.4 When it is necessary to provide a firm foundation, the base of the jack shall be blocked or cribbed. Where there is a possibility of slippage of the metal cap of the jack, a wood block shall be placed between the cap and the load.
- 4.1.6.2.5 All jacks shall be properly lubricated at regular intervals. The lubricating instruction of the manufacturing should be followed, and only lubricants recommended by him shall be used.
- 4.1.6.2.6 Each jack shall be thoroughly inspected at times which depend upon the service conditions. Inspections shall be not less frequent than the following.
For constant or intermittent use at one locality, once every 6 months.
For jacks sent out of shop for special work, when sent out and when returned.
For jack subjected to abnormal load or shock, immediately before and immediately thereafter. Repair or replacement parts shall be examined for possible defects.
- 4.1.6.2.7 Jacks which are out of order shall be tagged accordingly, and shall not be used until repairs are made.
- 4.1.7 Abrasive blast cleaning nozzle. The blast cleaning nozzles shall be equipped with an operating valve which must be held open manually. A support shall be provided on which the nozzle may be mounted when it is not in use.